THE WASHINGTON POST
15 June 1979

ARTICLE APPEARED
ON PAGE A-1, 12

Pastorius, Robert G.
ORG SALT
(orig under Kaiser)

Verification of SALT II: Art and Science

First of three articles

By Robert G. Kaiser
Washington Post Staff Writer

Could the Soviet Union cheat on the new strategic arms limitation treaty? Briefly stated, that is the issue known as "verification," already emerging as potentially decisive in the Senate debate on SALT II.

Seldom has an issue about which so little is publicly known assumed such significance in an important national debate. Although pundits and politicians have coined slogans out of aspects of verification—Iranian bases, encrypted telemetry and the like—no politician and no generally circulated news medium ever has attempted a detailed description of the fantastic Buck Rogers technology involved, the processes of evaluating information it retrieves on Soviet strategic programs or the reliability of the conclusions reached by American intelligence analysts.

"Verification" really is a thicket of political, technical and psychological considerations. And "verification"—"the authentication of truth," according to Webster—

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hardly is the right word for a procedure that involves as much art as science.

Apart from the complications involved, a blanket of official secrecy obscures the verification issues from public view. A corner of that blanket protects some of the United States' most sensitive intelligence secrets.

And apart from the tangible aspects of verification, there is a philosophical dilemma that bedevils any discussion of the subject. Succinctly stated by Amrom Katz, an expert and a skeptic about U.S. abilities to monitor Soviet strategic systems, the dilemma is this: "We have never found anything that the Soviets have successfully hidden." In other words, U.S. intelligence officials can be utterly delighted with what they can detect but never absolutely sure that they have not missed something important. This is the point at which art must guide science.

What the United States can detect is—at least to an uninitiated layman—staggering. Americans are familiar with the idea of spy-in-the-sky satellites, but their present-day reality goes far beyond the sort of aerial photographs first seen publicly during the 1962 Cuban missile crisis. They were actually taken from airplanes.

Today the United States has a combination of stationary and earth-circling satellites that not only take conventional pictures, but also record missile blastoffs, eavesdrop on other countries' radio communications, take infrared and "multispectral" photos and survey the weather over the Soviet Union and China. With the help of those satellites that monitor the weather, particularly cloud cover, the United States can activate its orbiting photo reconnaissance satellites from the ground as they pass over those parts of the Soviet Union that happen to be enjoying a sunny day.

The single most useful piece of intelligence equipment is not something in the sky, however, but something located (in great quantity) in installations all around Washington: computers.

With computers the United States can separate significant military communications from the great jumble of audible signals picked up by listening posts in space and on the ground. Computers help break other countries' codes. Computerized photo enhancement techniques can help "see" through camouflage or bring out tiny elements in sharp detail. Most important of all, computers allow the United States to make elaborate electronic "models" of Soviet rockets, warheads and airplanes enabling intelligence analysts to follow the technical development of these weapons in uncanny detail.

Perhaps the best way to begin describing American capability to monitor Soviet strategic activities is to trace the ways the United States follows the Soviets' land-based missile programs, which produce the weapons that most alarm American strategic planners.

This process starts with intelligence from the four Soviet design bureaus that design and test these rockets. (This appears to be one area in which the socialist Soviets have been persuaded of the merits of a little free-enterprise competition.)

In ways that have never been publicly described, the United States does get information about new rockets in development at these design bureaus before any of them have been tested in the open. We know this because Secretary of Defense Harold Brown and other officials have publicly said that the Soviets now have four new rockets in an advanced stage of development, going on to point out that under SALT II—which permits each superpower just one "new type" of rocket—Moscow will have to abandon or sharply modify three of the four.

When testing begins, the United States has numerous intelligence assets that can be exploited. Four Rhyolite satellites 22,300 miles in space hover over the Earth in synchronous orbit—which means they are always in the same spot relative to the Earth's surface—two in active use, two in reserve. These devices are equipped with infrared sensors that can detect a missile blastoff within seconds, and can also recognize the "signatures" of different rockets—that is, the infared pattern created by the way their fuel burns during the flight.

The most useful intelligence from a rocket test is the radio messages broadcast back to Earth during a test flight. Virtually every working part of a rocket and its warheads are monitored by radio transmitters that report back to Earth on the functioning of each. This is necessary, according to American space engineers and government officials, so engineers on the ground can trace and eventually rectify any malfunction that may develop during the flight.

Both the United States and the Soviets develop new rockets in a similar way, according to these sources. "Shoot a rocket over and over again," as one knowledgeable source put it, "fixing one unreliable element after another until you have a reliable system—that's how it's done."

This approach makes it necessary to send back to Earth more than 1,000 separate channels of radioed information—known as telemetry—during every test flight. For years the United States has been picking up this rocket telemetry from Soviet tests, and American analysts have apparently been able to identify each individual function that each channel reports on, and to interpret this information virtually as well as the Soviet engineers listening to it in the U.S.S.R.

In recent years the United States' best listening post for the collection of telemetry from the early—and most revealing—stages of a test flight has been the intelligence base in Kabkan, Iran.

Another base at Sinop in Turkey also picks up test telemetry, but it is nearly 1,000 miles farther away from the Soviet launching pads at Tyuratam. Because of the Earth's curvature, this means the telemetry sent from a Soviet rocket until it reaches an altitude of about 250 miles is inaudible from Turkey. (The base in Iran picked up all telemetry above an altitude of about 60 miles.)

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